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ABSTRACT

The Department of Commerce's Telecommunications and Information Infrastructure Assistance Program (TIIAP) is designed to address technology needs in the public and nonprofit sectors of the United States. This report is one of many ways that TIIAP is sharing the stories and the lessons that are being learned by recipients of TIIAP awards. The case studies in this report describe early experiments in building and using the information infrastructure; profiles are offered of how medical centers, schools and universities, police departments, social service organizations, state and local governments, Native American tribes, and others are using technology to reach the people in their communities. It shows how the elderly can receive better health care in their homes, how police officers can more easily locate suspects or track down stolen vehicles, and how residents of inner city public housing projects can participate more directly in their children's education. These projects show that the information revolution is not so much a process by which technology is changing society as one in which people are using technology to pursue their own goals for economic growth, educational opportunity, public safety, improved health, responsive government, and strong communities. (AEF)

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NETWORKS FOR PEOPLE: TIIAP AT WORK

TELECOMMUNICATIONS AND INFORMATION INFRASTRUCTURE ASSISTANCE PROGRAM

NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
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Networks for People: TIIAP at Work

The Telecommunications and Information Infrastructure Assistance Program

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October, 1997

DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA

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THE SECRETARY OF COMMERCE
Washington, D.C. 20230

Across America, communities are recognizing that telecommunications and information technologies are key to creating economic opportunities. Interactive networks are providing new job and educational opportunities. People in every state are benefitting with improved law enforcement protection for cities and towns and economic development plans for regions. Everyone in the nation benefits as businesses become more competitive and non-profit service organizations become more effective.

As Secretary of Commerce, I am pleased to release *Networks for People: TIIAP at Work*. The report underscores the Clinton Administration's commitment to promote public-private partnerships that will bring the benefits of telecommunications and information technologies to every American. The Telecommunications and Information Infrastructure Assistance Program (TIIAP) projects that are profiled in this report illustrate the pivotal role that these technologies can play in equipping American workers and entrepreneurs, students and teachers, doctors and patients, and parents and children with the skills and tools they need to meet the challenges of the Information Age.

The demands of the new information economy are stretching our human resources. We simply do not have enough computer and technology-literate Americans to meet the needs of our nation's businesses. Today, some 190,000 high-tech jobs remain unfilled across the country. We need to find ways to train our young people and retrain our current workforce. TIIAP projects are demonstrating a variety of models to meet these demands, including developing adult education and job training services and using technology to match job seekers with job opportunities. Other projects are providing youth with Internet-based skills to increase their computer literacy.

President Clinton and Vice President Gore are working hard to ensure that all of our nation's communities benefit from telecommunications and information technologies. TIIAP is playing an important role, as it focuses on underserved communities, especially inner cities and rural areas. TIIAP is helping to bridge the digital divide and create new opportunities for all Americans.

This report highlights the positive impact of telecommunications and information technologies on our communities. And strong communities, urban and rural, translate into a socially vibrant and economically healthy nation.

Sincerely,

William M. Daley

Preface

Across our nation, Americans are beginning to use electronic networks at work, school, and home. Increasingly, people are realizing the advantage of using telecommunications and information technologies to redefine who they are and what they do. Electronic communications networks are bridging isolated regions with the rest of our country and the world, as well as strengthening ties within communities.

The public and nonprofit sectors of our economy can benefit greatly from new technologies, but often lack the initial investment capital, or cannot afford to engage in exploration of new technologies. They need proven models. The Department of Commerce's Telecommunications and Information Infrastructure Assistance Program (TIIAP) is designed to address these needs. TIIAP promotes the widespread availability and use of advanced telecommunications technologies in the public and non-profit sectors. Since its inception in 1994, TIIAP has made matching grants to state and local governments, health care providers, schools, libraries, police departments, community-based non-profit organizations, and others to put the nation's information infrastructure to work in their communities. In the first four years, the program has awarded 332 grants, in all 50 states, totaling $100 million and leveraging $150 million in local matching funds.

TIIAP projects are using new information technologies and telecommunication services creatively to reinvent how children are taught, how diseases can be treated, how streets can be made safer, and communities made stronger. By demonstrating new applications of the technology, by identifying and overcoming obstacles, and by evaluating what works, each of these projects is helping to realize the promise of an advanced national information infrastructure that strengthens our economy and improves the quality of life for all Americans.

The projects produce a wealth of information about what works and what does not. The value of this lies in its wide dissemination. Last year, the Department of Commerce released *Lessons Learned from the Telecommunications and Information Infrastructure Assistance Program*, a report that focused on lessons that TIIAP project directors were learning in their projects. The lessons covered topics that were common to many different types of projects, such as hiring technical staff, working with vendors, choosing technologies, and planning for sustainability. With this report, we turn to the projects themselves to show how the technology is being used and the resulting impact.

We have called this report *Networks for People* to emphasize the importance of the user. While the telecommunications connections enable communication at a distance and the rapid flow of information, they do not, in and of themselves, teach people new skills, treat patients, solve crimes, or help people find jobs. The physical infrastructure is but one, albeit very important,

ingredient. In order to realize the opportunity that the infrastructure presents, we need to identify the people who will use the technology and who will benefit from it. We have to understand how it fits into our daily routine and how we can use it to improve our lives. This report offers profiles of how medical centers, schools and universities, police departments, social service organizations, state and local governments, Native American tribes, and others are using technology to touch the people in their communities. It shows how the elderly can receive better health care in their homes, how police officers can more easily locate suspects or track down stolen vehicles, and how residents of inner city public housing projects can participate more directly in their children's education.

This report is one of many ways that TIIAP is sharing the stories and the lessons that are being learned by the recipients of TIIAP awards. Additional information on the program and the projects is available from the TIIAP office and on the National Telecommunications and Information Administration's Web site — ***http://www.ntia.doc.gov***. Please share with us your reactions to this report — write TIIAP, 1401 Constitution Avenue, NW, Washington, D.C. 20230, fax (202-501-5136), or e-mail (***netpeople@ntia.doc.gov***).

Larry Irving
Assistant Secretary of Commerce for
Communications and Information

Introduction

Americans are hard at work turning the dream of an information society into reality.

Using the same technologies that have transformed the world of work, we are laying the foundation for new economic growth, particularly in our inner cities and rural areas. Schools and universities are offering students new learning and career opportunities. Health care providers are finding cost-effective ways to care for geographically-isolated patients. Governments and non-profit agencies are developing techniques to make their services more effective and more readily available. Law enforcement agencies are strengthening their hand in the fight against crime. Communities are pulling together to address common concerns and share common values.

The job is far from finished. While 40 percent of Americans have computers at home and 60 percent are exposed to some form of information technology at work, many of us still lack access to this basic tool of the information age. Some believe they never will have access, and others, while eager to acquire technological skills for themselves and advanced communications networks for their communities, are overwhelmed by the financial and technical hurdles.

The growing number of experiments around the country, however, including the 332 projects that have received grants from the Telecommunications and Information Infrastructure Assistance Program (TIIAP) since 1994, show that information technology is for everybody. It is for the inner-city teenager building a future career as a World Wide Web designer in East Palo Alto, California, and for the elderly diabetic in rural Kansas who hopes that daily electronic visits by a nurse will make it possible to stay out of a nursing home. It is for the Native Americans teaching their children about rainforests in barren Ignacio, Colorado, and for parents trying to keep their kids safe and healthy in Newark, New Jersey. It is for the municipal police forces trying to keep track of jurisdiction-jumping criminals in Pennsylvania and for the nonprofit organization trying to help poor families find their way through the maze of social service agencies in New Hampshire. And it is for the community network seeking to ensure that all citizens have access to information networks in New Orleans, Louisiana, and for the city government of Phoenix, Arizona, trying to make its own services more accessible to the public.

The case studies in this report describe early experiments in building and using the information infrastructure. Collective wisdom is emerging from them concerning the challenges involved in developing a more seamless and universal information system, and in sustaining projects that enrich the community. In keeping with TIIAP's priorities, the projects emphasize efforts to use

telecommunications tools to benefit society and to extend those benefits to disadvantaged individuals and communities. They also reflect TIIAP's conviction that efforts to build the information infrastructure must involve numerous partners and enlist broad community support.

In addition to demonstrating the benefits that new technology can bring, these and other telecommunications and information infrastructure projects inform us about a wide range of technologies — including not only the standard telephone-based communications links used in many areas, but also numerous alternatives such as a digital cellular communications system used by public safety agencies in Utah, high-speed cable modems used for Internet access in Aberdeen, South Dakota, and more.

More important, these projects offer guidance concerning the human aspects of creating an information infrastructure. How do you bring disparate institutions together to create an integrated communications system for a community? What works and what doesn't, when it comes to training people how to use the new information tools?

Clearly an enormous need exists throughout the United States and the world for the answers to these questions. Indeed, such information is especially important because the Information Superhighway, unlike the Interstate Highway System to which it so often is compared, is being built not by the federal government according to a single master plan but by countless partners in individual communities. With limited resources, we all gain by building on the knowledge developed by those persons pioneering new technologies or innovation applications. Much that is described here can be sustained and replicated in other places.

Finally, these profiles demonstrate the energy and enthusiasm that these projects have unleashed, as well as the strong commitment by numerous partners, both public and private, to ensure that the information revolution reaches all corners of society and achieves its promise of bringing us richer lives, greater economic opportunity, and stronger communities.

Plugged In

East Palo Alto, California

A Low-Income Community Joins the Information Age

Five years ago, residents of East Palo Alto, California, were in serious danger of being left out of the Information Revolution swirling around them in Silicon Valley. Now, they are part of that revolution, thanks in large part to a thriving community center called Plugged In.

Operating out of a storefront that sits between a check-cashing center and a boarded-up store, Plugged In offers members of a low-income community everything from local telephone service to basic and advanced computer classes. It helps social service agencies connect electronically with each other and the outside world. Teenagers who run a separate organization, Plugged In Enterprises, provide basic web-page design and Internet services to area businesses. And kids trained at Plugged In help host the global "LiveWire" program on America Online, which the *New York Times* calls "the world's most popular online teen chat service."

"The New York Times calls Plugged In's 'Live Wire' program the world's most popular online teen chat service."

After-School Access Bridges the "Information Gap"

These are no small achievements. "Before Plugged In existed, many kids here literally had never even seen a computer," says Bart Decrem, executive director of Plugged In. In a society where an estimated 60 per cent of all new

jobs will require skill with technology by the year 2000, East Palo Alto's technological impoverishment was a recipe for economic decline.

With help from Plugged In, East Palo Alto is starting to turn itself around. Grants from TIIAP and other donors have enabled the center to grow from an after-school program for kids into an electronic hub for its entire community. Open 12 hours a day, seven days a week, Plugged In offers classes to both children and adults. Kids drop in to use computers for homework assignments, and adults use the center to search the Internet for jobs. Some have even launched their own businesses from the center. Bishop Wethington, a 59-year old community resident, used the center's computers to study community college course material on contracting. Since landing his contractor's license in May, 1997, he has used the center's computers to prepare bids for contracts.

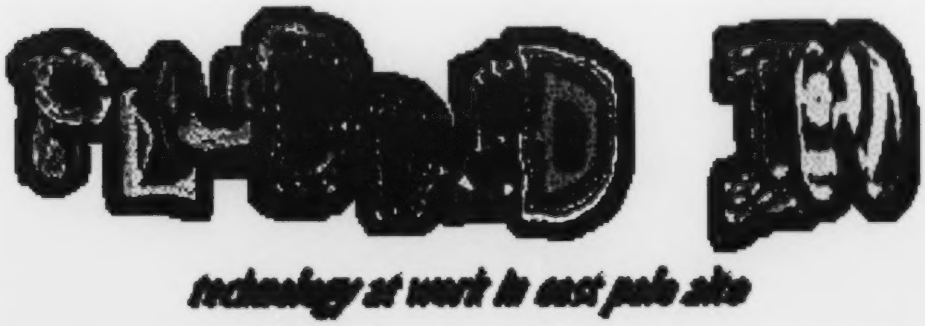
Plugged In works closely with several social service agencies. Besides training the partners' clients in how to use technology, it helps the various agencies mount their own web pages and forge electronic links with similar groups and City Hall. According to Priya Haji, executive director of "Free At Last," a local drug rehabilitation program, this has greatly improved her communications with funders, volunteers, government leaders, and the community at large.

Teenagers Build Job Skills

Plugged In has had a direct, positive impact on area students. Many local teenagers are now earning $5 an hour and typically work 20-hour weeks creating web pages for area companies. According to Decrem, showing youths that their skills will help them make money is an effective motivator.

Besides earning some of their own money, the students produce at least one web site a month on a pro bono basis, and they publish the community calendar, "epa.net," for distribution by e-mail, fax, and over the World Wide Web. The calendar provides "one window for Silicon Valley to see into the community, and get a broader understanding of what our community is," according to Haji.

LiveWire, the America Online chat group moderated by Plugged In students, offers East Palo Alto youths a chance to reach an even wider audience. According to the *New York Times*, they have seized the opportunity. The *Times* says the



program, in which students brainstorm "thoughtful topics" and conduct "passionate debates," has "that energetic elitist feel one would expect of a cutting-edge Silicon Valley endeavor."

As a new type of organization, providing services and opportunities that were not there before, Plugged In predictably faces new challenges. For sustainability reasons, Plugged In is looking ahead and working with Silicon Valley industries and local entrepreneurs to make sure the long-term financial support necessary for the project's continued success

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is available. Pioneering a new way for low income communities to join the information age takes time and thought, but Plugged In seems up to the challenge.

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Newark Public Schools

Newark, New Jersey

Making Healthy MUSIC in Newark

New telecommunications tools do more than enable us to leap effortlessly across geographic boundaries. They also help strengthen bonds within individual neighborhoods, as residents in the low-income New Community housing development in Newark, New Jersey, have demonstrated.

In 1994, the Newark Public Schools set out to install a computer network to link people who live in New Community with professionals at the nearby University of Medicine and Dentistry of New Jersey. The school board had grown concerned that unusually large numbers of children from the neighborhood were having trouble in school because they often were sick. Healthcare providers, meanwhile, were concerned because census data showed that people from the area surrounding the university medical center were being admitted to the hospital at unusually high rates for services that either would be unnecessary if people received appropriate primary care or could be provided more efficiently in clinics or doctors' offices.

"Before Making Healthy Music, the street that runs between the medical school and New Community might as well have been a moat. Now, the community seems more knowledgeable and sophisticated about health."

Dr. Caryl Heaton
Associate Professor
Clinical Family Medicine

Hoping that a computer network would give people information that would enable them to improve their health, Pamela Morgan, a project coordinator in the Newark Public Schools, helped secure TIIAP funds to install computers at the Newton Street School and in the homes of a group of

neighborhood "captains." The school provided computer training and helped maintain the system. Each captain agreed to let members of at least four other families enter their homes to use the computers.

The Neighborhood Information Infrastructure

For software, Morgan turned to Dr. Alan Shaw of MIT's Media Lab, whose "Multi-User Sessions in Community," or MUSIC, system enables participants to go online to share information on community services and activities, send and receive e-mail, participate in live "chat" groups, or engage in sustained discussions through various community forums. Participants also can use the Internet, but Shaw deliberately plays down that capability. "The NII, to us, is more than the National Information Infrastructure," he says. "It is really the *Neighborhood* Information Infrastructure."

Since launching the project, New Community neighbors have held forums dealing with AIDS, lupus, asthma, and the common cold. People have gone online to ask medical professionals about health concerns. Parents have asked whether sugar really makes kids hyperactive. In one chat group, doctors talked about the importance of exercise for health, and a group of neighbors responded by forming a walking club.

Connecting Families and Doctors

Dr. Caryl Heaton, associate professor of clinical family medicine at the university, says the project has made a difference. "Before Making Healthy Music, the street that runs between the medical school and New Community might as well have been a moat," she says. "Now, the community seems more knowledgeable and sophisticated about health."

The community's enthusiasm for the project has, in some cases, outstripped the ability of medical professionals to respond — partly because workloads at the university have increased in the face of budget cuts. Cynthia Washington, one of the project captains and president of the Newton Street School's PTA, says some of the most useful suggestions she received for dealing with her son's asthma actually came from her online neighbors.

Washington and other neighborhood residents have used Making Healthy Music for much more than addressing health issues. Women, men, kids, young fathers, and others have all formed discussion groups. One participant started a discussion that led neighbors to plant a community garden. And in another online conversation, community members persuaded the New Community Corporation to build a recreation center so that teenagers can gather without having to leave the neighborhood.

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All this has given residents a new sense of opportunity and self-esteem, Heaton and others agree. Washington, who recently went back to school to hone her word-processing skills, says she has been able to increase attendance at PTA meetings. She marvels that she can send an e-mail message to the school principal from her home, and thrills to see her children conducting Internet research for school and participating in online chat groups with their neighbors.

"We thought we would put community people in touch with medical people and each other to explore health issues," says Morgan, "but the project has mushroomed into an all-encompassing community revitalization project."

for more information, contact:

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City of Aberdeen

Aberdeen, South Dakota

Aberdeen: Building Its Own On-Ramp to the Information Superhighway

When federal planners laid out the interstate highway system, they passed by Aberdeen, South Dakota, in favor of more heavily populated areas. Aberdeen is determined to avoid repeating that experience as the Information Superhighway gets built.

A city of 25,000 in the sparsely-populated northeastern corner of South Dakota, Aberdeen has spearheaded a regional telecommunications project designed to tie its region together and link it to the outside world. Dakota Interconnect, as the project is known, already has met with some success: the first two-way interactive video transmission ever made from the U.S. Senate's television studio in Washington, DC, linked federal officials with people in Aberdeen over the new system.

"If we're going to survive economically, if we're going to give our children the advantages of small-town life rather than see them all move away, we've got to attract industries that use high-tech, rapid audio and visual data transmission."

Mayor Tom Rich

Connecting Small Town Comfort with Big City Opportunities

"What are the chances of getting a high-level public servant or government official to fly into Aberdeen to give a presentation?" asks Aberdeen Mayor Tom Rich. Before Aberdeen had its high-speed communications links, people in the region had a much harder time contacting distant decision-makers. But now, they can. As

Rich sees it, they can also work for anybody in the nation. Companies interested in taking advantage of the small-town comforts of places like Aberdeen can locate branch facilities there, knowing that they can easily communicate with their home offices. And employers can use teleconferencing to provide employee training that otherwise might be logistically difficult or prohibitively expensive.

These are significant new opportunities for the economically troubled, 12-county region surrounding Aberdeen. The region's population has declined sharply over the last two decades; in the 1980s, outmigration totaled 14 per cent, double the rate for the rest of South Dakota. Agricultural mechanization has led to a sharp decline in the number of farms. And even though farm sizes have increased, farm incomes have decreased and many farm families need other jobs to make ends meet.

Rural America Gets on the Information Superhighway

Building an on-ramp to the Information Superhighway is not cheap; Aberdeen relied on TIIAP for $900,000 of Dakota Interconnect's $2.4 million price tag. As Aberdeen demonstrated, however, rural communities eager to build their own electronic on-ramps do not have to start from scratch. Many already have at least some of the pieces needed to build their own information infrastructure.

When Aberdeen launched its project, for instance, the city already had CityNet, a fiber optic network that local government and educational institutions used to exchange data. A group of eight schoôl districts in a three-county, 3,200-square-mile area operated North Central Area Interconnect, a distance-learning project that uses microwave technology. Aberdeen's own Northern State University was connected to

the Rural Development Telecommunications Network, a statewide system linking colleges and universities.

Dakota Interconnect tied these previously separate networks together and helped them forge links to the Internet. At the same time, numerous partners joined a cooperative effort to build out the system. The city of Aberdeen, the local county government, and the local library all established studios for teleconferencing. Midcontinent Cable, a privately-owned cable-television system that operates CityNet, started offering residential customers high-speed Internet access via cable modem. Northern Rural Cable TV, which serves rural areas around Aberdeen, similarly agreed to offer its customers Internet access over its wireless system. The Aberdeen Development Corporation, a non-profit economic development enterprise, built a "Smart Connections Center" to serve as a telecommunications hub for small businesses.

At least 15 different partners joined in the effort, which is already bearing fruit. Presentation College in Aberdeen, for instance, is using the system to offer nursing classes at its satellite campus on an Indian reservation in Eagle Butte, South Dakota, some 150 miles to the west. The South Dakota Student Loan Corporation, a nonprofit agency, joined CityNet and now uses the system to exchange data and confer with

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the State Department of Education in the state capital, Pierre. St. Luke's Midland Regional Medical Center has assembled a dozen health-care providers to use the system for remote medical consultations. And the Smart Center already has attracted a tenant: Vallon Inc., a Minneapolis software development company that designs web pages.

Pulling the disparate partners together and melding the different technologies into a single system was no easy task. "We held a lot of meetings and did a lot of hand-holding to get people to buy in totally for the benefit of the whole," says Mayor Rich. In the end, he says, each partner recognized that a well-developed information network would be worth much more to everybody than the sum of its parts.

"If we're going to survive economically, if we're going to give our children the advantages of small-town life rather than see them all move away, we've got to attract industries that use high-tech, rapid audio and visual data transmission," says Mayor Rich.

for more information, contact:

Tom Rich
Mayor

(605) 626-7025

Foundation for Educational Innovation

Washington, DC

A New Foundation for Schools in the District of Columbia

Almost everybody is excited about the possibility that new information technologies will transform schools. Ideas about the nature of that change, however, have evolved considerably in the last few years, as Archie Prioleau can attest.

Prioleau is Director of the Foundation for Educational Innovation, which received $450,000 from TIIAP in 1994 to help build state-of-the-art multimedia computer laboratories at schools in some of Washington, DC's poorest neighborhoods. From these "technical learning centers," students would be able to participate in "virtual visits" to remote locales such as the New York Hall of Science Museum. Cameras at the museums would follow "explainers" as they led classes through the exhibits, answering questions from students during real-time, full-motion visits.

It was an engaging vision, and the Foundation showed that it could be done. But along the way, Prioleau learned some valuable lessons. In many ways, his journey sums up what many educators are learning about the role of new information technologies in our schools.

"Two of the Ballou seniors have since passed the [network administrator's] exam . . . and have moved on to networking jobs. . . . Six other students who completed the program but have not yet passed the test have been hired by or offered jobs with area technology companies."

The Washington Post
August 5, 1997

Schools Can't Compete with Television and Video Games

First, Prioleau says, the project showed that it is very difficult for educational media projects to compete with television

or video games in production quality. "For successful virtual visits, I needed more money than I could ever get," he says. "I could not give you the quality of production I needed for kids who were used to Nintendo or videos."

Perhaps more important, Prioleau adds, the original virtual visits failed to stimulate many students. As the Foundation noted it in its final report to TIIAP, "simply allowing an explainer to talk while the student listens is a passive method of learning no different from the early adventures of television. It does not work." The original museum visits failed to meet the needs of teachers and school administrators, too, the Foundation said. Without an overall educational theme, a visit to a museum — whether virtual or real — "does not support meaningful learning outcomes or curriculum disciplines as dictated by a school system."

New Education Strategies Create Active Lifelong Learners

These insights led the Foundation to adopt a more complex, interactive approach to learning. Rather than passively receiving information, students were asked to investigate something in the real world — such as the Anacostia River running through Washington — and then to exchange their findings and ideas with other students over the Internet. In this new strategy, creating new content took a back seat, and technology came to be used more as a tool to help students analyze and share information.

Prioleau learned other lessons as well. Along with many others who have pioneered the role of computer networking in education, he now stresses the importance of helping teachers use technology to achieve their educational objectives. Prioleau argues, among other things, that teachers

need to have computers right in their classrooms so that they can prepare their lesson plans. He also has adopted new designs for his computer labs — instead of lining up computers along the walls so that students have to face away from their peers while using them, he now seeks to encourage more collaborative learning by arranging the computers so that students can still see and interact readily with each other.

Students Graduate to Jobs With a Future

Prioleau's journey did not stop there. One day, an eighth-grade student proudly told him that she was earning money by teaching other kids how to use computers. "What's making this child feel most happy, most secure, most willing

to go forward is that she's self-sustaining," he says. "The computer is a vehicle to help you learn, and the reason you want to learn is to make a living."

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Building on that insight, Prioleau worked with Utah-based Novell, Inc., to develop curriculum materials to teach students at Ballou High School in Washington how to become computer-network administrators. Novell also agreed to let students who complete the course work take its standard exam to become certified network administrators. At the same time, BTG, Inc., a Virginia information-technology company and Electronic Data Systems Corporation pledged to hire graduates who successfully complete the program. The first 17 kids finished the program in the spring of 1997. Now, the Foundation is working with some 40 business, community, and government officials to establish a system that will prepare students for technology-related jobs in other industries.

By Prioleau's own account, the Foundation has travelled "light years" in its thinking about the role of technology in education since TIIAP helped it get started in 1994. Instead of using the Information Superhighway simply to bring more information to passive students, educators increasingly stress the importance of helping children use technology to become active, lifelong learners and to find their way in the emerging information economy.

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Greater New Orleans Free-Net

New Orleans, Louisiana

Greater New Orleans Free-Net: Diverse Partners Make a Community Network

It takes a lot of work — and many partners — to make a community network.

In Louisiana, school districts in nine Louisiana parishes, the New Orleans public library, powerful business groups such as the Chamber of Commerce and the New Orleans Tourism Marketing Corporation, a few individual corporate benefactors, more than 180 nonprofit organizations, and the state of Louisiana have all joined forces to form the Greater New Orleans Free-Net. The free-net helps ensure all residents access to some of the basic tools of the Information Age, including community information, e-mail service, and basic Internet access. The Greater New Orleans Free-Net is a non-profit community computing system, available 24 hours a day at no charge to anyone with access to a computer in the home, at the office, in school, or at a participating library.

"The free-net has so convinced the Louisiana State Legislature of its value that lawmakers voted in early 1997 to give it $1.1 million to double its size. As a result of the state action, the network soon will reach an area with 2.3 million people, or about two-thirds of the population of the state of Louisiana."

At a time when free-nets in many cities are struggling to secure their long-term survival, the New Orleans project could provide some useful lessons on how to survive. Though its own struggle is not yet over, the outlook is encouraging. After just two years of operation, it has attracted 15,000 registered users and now provides Internet connections and teacher training in 126 public and private schools. And, significantly, it has so convinced the Louisiana State Legislature of its value that lawmakers voted in early 1997 to give it

$1.1 million to double its size. As a result of the state action, the network soon will reach an area with 2.3 million people, or about two-thirds of the population of the state of Louisiana.

Partnerships Result in Educational and Economic Resources

How did the New Orleans network achieve this success? Executive Director Jessica Bray says a $370,000 TIIAP grant, matched by locally-raised funds, gave the project an important jump-start. During the 1995 TIIAP competition, the New Orleans Free-Net exemplified a project which had strong institutional support, both from the community and from its partners. The numbers of people who would be impacted in the nine-parish region was also impressive. With TIIAP funds, the network was able to begin providing teacher training throughout the nine parishes it originally served. It also produced a CD-ROM Internet training package for teachers. And it formed a "High School Technology Institute," in which 14-year-olds hone their own computer networking skills either by developing and promoting web sites for local non-profit groups, or by manning the free-net's own "help desk" to assist others who are having trouble finding their way in the online world.

All these projects helped put the free-net in the public eye. So, too, did the free-net's "Greater New Orleans Job Bank" and "Project Opportunities" web sites, which list job openings and certificate and degree programs offered by educational institutions in the region. "The projects have made all the difference," says Bray. "You have got to show people a product, and then you can get them on board."

A key strategy is getting all the partners to invest. Schools, parish governments, and non-profit organizations

all contribute to the free-net to help defray the costs. Schools' participation and the involvement of nonprofit groups are important, according to Bray, because they demonstrate a widespread commitment to the project that many potential corporate donors are eager to see. "Business doesn't want to fork over hundreds of thousands of dollars to deliver something free to teachers," says Bray. "They want the education system at the table."

On the business-sector side, the free-net receives $35,000 from the Chamber of Commerce, and another $12,000 from the New Orleans Tourism Marketing Corp. It also lined up a few individual corporate sponsors. First NBC Bank provides $50,000 — enough to have its name appear on the free-net's home page. Louisiana Land and Exploration provides funds to sponsor a web site dealing with waterways and weather.

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Similarly, the New Orleans Levee District, a quasi-governmental body, provides funds for its own web site, which explains the region's complex flood-control system. And the free-net is looking for individual supporters as well: this July, it operated its first on-line fundraising drive.

Community Envisions Library of the Future

Bray sees all these efforts as interim steps. Ultimately, she argues, municipalities will finance free-nets, much as they do libraries. Indeed, she believes free-nets will follow a path paved by libraries. Like free-nets, most libraries were started by philanthropists and other grass-roots groups, she says; public funding came later, as government officials came to recognize the importance of promoting literacy. Today, according to Bray, public officials are starting to recognize that computer literacy is as much a prerequisite for finding good jobs and participating in society as the ability to read and write. Already, she notes, the New Orleans Public Library provides $25,000 a year for the free-net, and the sizable contribution from the state of Louisiana shows support is growing on the state level, too.

"Many of us believe free-nets will become a part of municipal and state funding over the next five to 10 years," concludes Bray. "How to survive until then is the key. Our strategy is to maintain our nonprofit status, utilize corporate underwriting, collect education dollars, and seek more nonprofit partnerships. When you have everybody putting in a little, we all get a lot."

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City of Phoenix

Phoenix, Arizona

Phoenix: Using Technology to Serve Government's "Customers"

The city of Phoenix opens its "values and vision" statement with the phrase: "We are dedicated to serving our customers." Thanks to some imaginative use of information technology, this is no hollow phrase.

"Phoenix at Your Fingertips," a World Wide Web service operated by the city, offers the 1.1 million residents of Phoenix (as well as the global Internet audience) a comprehensive and readily accessible menu of virtually every service the city has to offer, from where to find job training to how to have a fallen tree removed. Citizens can use the web site to learn about public meetings or send e-mail to city officials. They can anonymously report crimes to the police or obtain crime prevention tips. They can read neighborhood newsletters or use the local library's card catalog. And they can follow links to over 250 outside agencies. Funding from TIIAP was critical in developing public-access stations across the city, so that the web resources are available to all citizens — not just the citizens who are already online themselves.

> ***"We organized the site so that it's from the citizens' perspective."***
>
> ***Kristine McChesney***
> ***Deputy Information Technology Director***

Government Information Made Easy

Many other cities have also gone online to provide information on city services and activities. The Phoenix project stands out for the extent to which it presents the information in a user-

friendly manner. In its service, bureaucracy has disappeared, and information is presented in categories — employment, environment, health, volunteer programs — that everyday citizens can readily understand.

"We organized the site so that it's from the citizens' perspective," explains Kristine McChesney, Deputy Information Technology Director.

That may not sound revolutionary, but developing the system required considerable effort. The common — and easy — approach to putting city information online is to let each department devise its own web page. But citizens often do not know which department offers the particular services they need. If you are looking for job training opportunities, for instance, should you contact the "Education Programs Office" or the "Human Services Department"? Should you call the telephone number for "water conservation" or "water services" to determine when you can water your lawn? For help in starting a small business, should you turn to "Community and Economic Development" or "Development Services"?

To make city government more accessible, information technology officials in Phoenix had to persuade departments to give up some control and ownership of their individual programs so that information could be reorganized and presented in ways that make sense to citizens. The effort paid off. Citizens using the web site do not need to try to find their way through a bureaucratic maze, since information is organized with the end user, not the service provider, in mind. Looking for work? The web site tells you in one place how to apply for a city job, search various job banks and classified ads, polish your job-search skills, or find training opportunities. Do you have a safety concern? The city offers information on everything from babysitting safety techniques to

household hazardous materials, all gathered from numerous sources.

Interaction Allows Responsive Government

The web site also has useful search features. A community calendar lists an extensive set of upcoming events, but also enables citizens to chose from seven specialized calendars, such as one listing just arts, culture, and science events, or one that features sports. Alternatively, individual users can customize their own calendars by selecting which of 33 different categories of events they want to see listed.

Officials are developing a keyword searchable database. The search tool is being developed as part of the City Manager's "Seamless Service" initiative to help city employees find the appropriate contact in government for citizens who call for help.

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McChesney notes that city-run information services like "Phoenix at Your Fingertips" have some advantages, and some disadvantages, compared to grassroots initiatives. On the negative side, a government system has to be a bit more restrictive concerning what kinds of information it presents; Phoenix generally does not allow organizations to post their own web pages or information on its system (a few organizations for the disabled are exceptions to this rule). On the plus side, however, the city has greater resources and professional staff — including six full-time and some part-time city staffers. As a result, its web site is particularly well organized, sophisticated, and consistently useful.

Users seem to approve of the results. The number of "hits" on the city web site has climbed each month since it was introduced in June 1995, hitting a staggering 577,325 in June, 1997. With help from TIIAP, the city has established more than 33 public-access stations at 20 different sites, such as libraries, senior citizens centers, and nonprofit organization offices, and trained volunteers are available at many sites to help users. Almost every neighborhood is now within three miles of a public work station, and the city is planning on adding new sites in the future.

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Grace Hill Neighborhood Services

St. Louis, Missouri

Grace Hill: Bringing Services to Low-Income Communities

As welfare reform requires the poor to become more self-reliant, social service agencies — especially jobs programs — must improve their outreach. Grace Hill Neighborhood Services in St. Louis, Missouri, is using information technology to accomplish both goals.

Grace Hill, a multi-service United Way agency, won a 1994 TIIAP grant to install touch-screen computers at various community centers and other public places in 11 disadvantaged neighborhoods. Grace Hill arranged for the Missouri Department of Labor and Industrial Relations to make its resources available to residents over the new computer network. It also sought to use the computers to expand an innovative barter system in which residents had been exchanging services with each other.

"Roughly 20 per cent of Grace Hill clients who have tapped into the state-maintained job listings had never registered previously to use the employment service. And about 10 per cent of the registrants have gone on to land jobs."

Making Jobs Available

By all accounts, the bootstraps project has worked well. For many of the people in the troubled neighborhoods Grace Hill serves, the nearest state employment office is too far away or too intimidating. But the neighborhood computer terminal is easier to reach and less threatening. By installing the computer terminals in accessible community centers, Grace Hill has enabled a significant number of people to take advantage of the state's "Missouri Works" employment-service pro-

gram — a development that has special significance now that Federal law limits how long individuals can collect welfare. Roughly 20 per cent of Grace Hill clients who have tapped into the state maintained job listings had never registered previously to use the employment service. And about 10 per cent of the registrants have gone on to land jobs.

The growth of Grace Hill's barter system, called the "Time Dollar Exchange," has been even more impressive. In 1994, the year before the system was computerized, Grace Hill brokered an estimated 26,000 exchanges. Clients who wished to participate had to go to one of Grace Hill's 10 offices to participate. Grace Hill staff recorded what services they were offering — whether running errands, providing transportation, taking care of children for working parents, or doing household or automobile repairs — on hand-written index cards, searched the files for offers involving services donor needed, and kept track of the various exchanges. For donors, an hour's work earned a right to claim an hour's worth of services.

Since it was computerized, the system has expanded substantially. By 1996, with the computer system enabling people to record their own offers and find the services they need at 40 locations rather than Grace Hill's 10 offices, there were some 60,000 exchanges, more than double the previous number, according to Renee Richardson, Director of the Exchange Program. An estimated 5,000 people now participate in the barter system.

These gains have come at no additional cost to Grace Hill. "We're serving a lot more people, but I haven't had to hire any additional staff," says Richardson.

People Helping People

Richardson attributes the success of the employment program partly to the fact that Grace Hill work stations are closer and more convenient for many of the people in the neighborhoods being served. An even more important factor, however, may be the human part of the equation: Grace Hill trains volunteers to help community members use the

computer system, and when a client sees a job he or she wants to pursue, a volunteer contacts the employment service, gets more details and helps the job seeker arrange an interview — all without requiring the client to leave his or her own neighborhood.

While the state employment office can seem impersonal and overwhelming to some people, the volunteer men-

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tors make the Grace Hill system friendly and approachable, Richardson says. "There's never a fear that you're being judged by a staff person."

Even some of the program's biggest problems are really a sign of its success. The mentors, who receive 40 hours of hands-on computer training, have a tendency to move on quickly to paying jobs in the private sector. As a result, "We've had to train about twice as many mentors as we had planned," says Richard Gram, Grace Hill's Executive Director.

Gram envisions providing even more resources over the work stations in the future. The city of St. Louis, which provided funds for an additional 12 work stations, now provides information about city services over the network. The system eventually will carry information on public transit routes and schedules. In addition, other agencies frequently used by Grace Hill's clientele will be added to the database, and efforts are underway to develop software that will show users the location of other agencies they may want to visit in person.

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Hays Medical Center

Hays, Kansas

Hays Medical Center: Your Nurse Is as Close as Your Television Set

The Hays Medical Center in Hays, Kansas, is giving new meaning to the term "outreach."

Hays uses telecommunications tools to give homebound elderly and disabled patients a chance to have daily contact with health-care providers without ever leaving their homes. The result is more than better care at an affordable cost. For some patients, the service has meant being able to stay at home rather than having to move to nursing homes.

Located about half way between Denver and Kansas City, Hays received a $300,000 TIIAP grant in 1995 to link medical centers in Rawlins, Wyandotte, and Ellis Counties, Kansas, and Jackson County, Missouri, with 100 home health patients over two-way, cable-television connections. With this tool, nurses now can "visit" these patients regularly in their homes, monitoring their general health, medication, diabetic condition, blood pressure, diet, hygiene, and mental health.

"For some patients, the service has meant being able to stay at home rather than having to move to nursing homes."

Electronic Connections Improve Health Care Efficiency

For the medical center, that adds up to a considerable gain in efficiency. A nurse using the system can see twice as many patients as before — even during a blizzard, notes Robert Cox, Hays' Medical Director. Patients gain as well: the lower cost and

ease of making connections translates into more visits — a big advantage for patients who need frequent attention.

Kathy Rupp, a home health nurse at Hays, tells of one diabetic woman who often refused to get out of bed in the morning. Because she failed to take her medicine on the correct schedule, she frequently became ill and had to be admitted to the emergency room. After Rupp began paying her two electronic visits a day — including one wake-up call — the woman found herself feeling so much better that she became motivated to take better care of herself. Eventually, Rupp was able to cut back to one visit a day.

Rupp also worked with an elderly man fighting depression. He too failed to take his medication on the prescribed schedule, and as a result was often belligerent. When the telemedicine project began, he was about to be evicted from his apartment. But his mood and behavior improved markedly after Rupp began paying him regular telemedicine visits, and he was able to stay at home rather than being admitted to a nursing home.

Cox believes regular electronic visits from nurses also have helped patients with emphysema and other chronic pulmonary problems. For such patients, anxiety can bring on an onset of symptoms or significantly worsen their conditions. Simply knowing that somebody will be checking up on them regularly eases their concerns and substantially improves their physical condition, he says.

Clearer Communication with Patients

Still, how good can care be if delivered over a television set? In some ways, it can be better than care provided in person, Cox and Rupp contend. "You learn to communicate

better because you can't see everything," says Rupp. "You learn to ask the patient more and to put your questions in terms you are sure they will understand."

She believes patients also learn to communicate more effectively too. "Some learn to tell me what I should be looking for," says Rupp. She recounts the case of a woman suffering heart trouble who told her during a routine visit that

she had a lot of swelling in her legs and ankles and found herself short of breath even when walking a short distance. Rupp immediately arranged for the woman to see a doctor, who promptly prescribed new medication. "Her swelling quickly went down, and she said she had more energy," says Rupp.

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Cox is convinced that telemedicine will grow substantially in the future. For example, he says, patients could receive physical, occupational, and speech therapy via telemedicine systems. "I foresee a mushrooming of applications for this technology," he says. Even some skeptics are starting to agree. Once reluctant to back the Hays project, the medical center's own administration has agreed to pick up the cost of continuing the salaries of two nurses, and it has helped pay for some new equipment now that the TIIAP grant has run out.

Moreover, Kansas Blue Cross-Blue Shield and the state of Kansas Medicaid program both have concluded that telemedicine is cost effective. They now cover the long-distance health care services the Medical Center provides. As yet, the Federal Medicare program does not cover telemedicine, although advocates hope it eventually will.

In the meantime, Hays is experimenting with ways to make telemedicine services even more widely available. The current system, which operates over local cable-television networks, was limited to cable providers' service areas. But Hays plans to test the use of regular telephone lines. If successful — and preliminary indications are encouraging — that will enormously increase the medical center's reach while bringing down the cost of the service.

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Children's Alliance of New Hampshire
Derry, New Hampshire

Children's Alliance of New Hampshire: Doing More with Less

If ever there was a time to marshall the resources available to help the disadvantaged, it is now. With Federal law limiting how long individuals can collect welfare, and with voters expressing concern about bureaucratic waste, social service agencies have come under tremendous pressure to serve their clients more effectively and, at the same time, trim their costs.

With the help of TIIAP, the Children's Alliance of New Hampshire, a nonprofit organization, has found a way to achieve both of those goals. Since 1995, it has been testing a computerized system that enables diverse agencies to help screen applicants for each other's services. Using the system, a caseworker at any one agency can collect information that will determine whether a particular individual or family is eligible for benefits offered by any of the participating service providers. By sharing this information over a secure computer network (provided the applicants approve), agencies can eliminate duplicative information-collection and application procedures.

"If we can provide services in a comprehensive, coordinated way, we have a much better chance of helping people become self-sufficient for the long term."

Steve Geller
Executive Director
Rockingham Community Action

Addressing Changes in Welfare

More is at stake than administrative efficiency. The system increases the chances that disadvantaged families will receive all the benefits for which they are eligible — something that often does not happen in the current patchwork system of social service

programs. Social service agencies hope that if clients are able to collect a more comprehensive array of benefits, they will stand a better chance of making lasting progress toward self-sufficiency.

"If we can provide services in a comprehensive, coordinated way, we have a much better chance of helping people become self-sufficient for the long term," says Steve Geller, Executive Director of Rockingham Community Action in Portsmouth, New Hampshire.

SafetyNet-New Hampshire, as the Children's Alliance program is known, is one of a series of efforts by public and private agencies around the nation to use telecommunications to improve both the quality and cost-effectiveness of social programs. "The idea is to serve people more efficiently, create a seamless web of services, and improve our ability to track outcomes, both for individual clients and in the aggregate," says Geller.

The centerpiece of the SafetyNet-New Hampshire project is Benefit Outreach Screening Software, or BOSS. Developed by the United Seniors Health Cooperative and customized for New Hampshire through the Children's Alliance, BOSS poses a detailed set of questions and then assesses the answers to determine whether individuals are eligible for any of 50 separate federal, state, and community-based benefit programs and services. With the help of a counsellor, an applicant who comes to one agency seeking, say, emergency food assistance, might learn that he or she is eligible for fuel assistance or a range of family health services.

Streamlining the Social Service Process

The Children's Alliance adopted the program after research funded by the Annie E. Casey Foundation showed

that many families do not take advantage of all the benefits for which they are eligible. Focus groups involving rural families showed that information about programs such as Food Stamps, Medicaid, Child Care Assistance, and Fuel Assistance is distributed unevenly, and that many families are overwhelmed by complex application procedures and eligibility rules that vary from program to program.

Children's Alliance of New Hampshire

Rick Silverberg, Director of the Health First Family Center in the town of Franklin, says the BOSS system already has streamlined the client "intake" process. Caseworkers and program beneficiaries save time because much of the basic information required to determine eligibility for various services can be collected only once, instead of repeatedly at each agency. In addition, because BOSS is regularly updated to account for frequent changes in regulations affecting various programs, caseworkers find it easier to stay current on eligibility requirements for scores of programs.

"Case managers say this is making their jobs much, much easier," says Silverberg.

SafetyNet-New Hampshire could do something else as well. According to Geller, the systematic record-keeping facilitated by the network could help authorities measure the overall effectiveness of the social safety net. "Right now, we don't know the cumulative effect we're having as we move people through this network of services," he says.

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Borough of Munhall

Munhall, Pennsylvania

TUPPER: A New Tool in Police Arsenals

Crime knows no boundaries, but police forces do — a situation that lawbreakers regularly exploit by moving from jurisdiction to jurisdiction to escape authorities. Several police departments in the Pittsburgh area, however, are using one of the most basic tools of the information age — e-mail — to fight back.

In 1995, the Borough of Munhall Police Department and six other municipal police forces in the South Hills area around Pittsburgh came together to establish a common computer network. Using TIIAP funds, the project, known as the Technology Utilization Pilot Project for Enhancing Resources (TUPPER), had three basic goals: to enable the roughly 230 officers in the various departments to communicate by e-mail; to compile a single database detailing all the contacts the various departments had with various individuals; and to create a central mug-shot library that could be used to identify criminal suspects.

"Within an hour, the suspect's picture was in the hands of 300 police," Chief Parker says, reporting that the probable assailant was soon apprehended. "He had nowhere to hide."

Faster Communication Solves Crimes Faster

That may not sound revolutionary. Private companies have been using computers for e-mail and data collection for years. But it was a big step for the police forces. "Law enforcement is 30 years behind the business community when it comes to technology," says Darrel Parker, Chief of the Munhall Police Department.

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Before adopting the TUPPER system, Parker says, most police departments in South Hills used pink "While You Were Out" message slips to notify officers of missed telephone calls. Because an officer in another department could work any of three shifts with an unpredictable pattern of days off, the simple task of communicating with a colleague in another department could take days of frustrating telephone tag.

Crime investigations were stymied in other ways, too. Many crimes are solved through informal information-sharing. Two police officers meeting for a cup of coffee may discover that they both have been dealing with a particular individual. One officer may have a long history of experience with somebody who has just showed up in the other's jurisdiction. Or, both policemen may discover correlations between seemingly unrelated incidents that could help solve some crimes. Often, for instance, a rash of car thefts in one area may relate to a series of break-ins elsewhere, as burglars often steal cars so that they can travel to areas away from their homes to avoid detection.

Important as such coffee klatches are, they have become increasingly difficult to arrange because of tight schedules and increased workloads. TUPPER allows such information-sharing on a much quicker and more comprehensive basis. Using software called The Informer, the TUPPER project has helped participating police forces create a "master name index" that includes dossiers describing any contacts they have had with particular individuals. The files, which are updated routinely as new information becomes available, provide useful background information. They even allow officers to add "special instructions" that can prove very helpful — such as whether an individual is known to carry a gun.

According to Chief Parker, the TUPPER system has advantages over existing crime databases. The National Crime In-

formation Center, for instance, details the criminal record of felons. But unlike TUPPER, it requires officers to know the exact name, date of birth, or Social Security number of their target. TUPPER, on the other hand, works even if officers only know a suspect's alias or have partial information.

Technology Aids Law Enforcement

An incident in Clairton, one of the participating municipalities, shows another advantage of the TUPPER system. One Saturday night in early 1997, a 14-month old sitting in a car was killed in the crossfire of a suspected gang battle. A

witness identified the assailant. When police turned to Pennsylvania's state crime office, the Bureau of Criminal Identification (BCI), they were told that the network staff could not duplicate a mug shot for them until their office opened the following Monday. Because the suspect had a history of run-ins with police in nearby South Hills, however, the TUPPER system already had an electronic mug shot.

"Within an hour, the suspect's picture was in the hands of 300 police," Chief Parker says, reporting that the probable assailant was soon apprehended. "He had nowhere to hide."

TUPPER has attracted the attention of other members of the law enforcement community. The original seven participating departments have grown to 13. A state parole officer is now connected to the network. On occasion, police in some neighboring jurisdictions have asked participating agencies to search the database for information. And 11 other police departments have asked to come on board.

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Valley Emergency Communications Center

Murray City, Utah

Linking Emergency Personnel to the Information Infrastructure

Move over, Dick Tracy. Tracy, the comic-book character, made the wrist phone famous, but police and other emergency personnel near Salt Lake City have an even more sophisticated communications system: they can connect with dispatchers and tap into vast databases from laptop computers right in their vehicles.

Their system was developed by Valley Emergency Communications Center in Murray City, Utah, about three miles south of Salt Lake City. VECC dispatches emergency services over a 120-square-mile area that spans seven political jurisdictions serving a population of about 566,000 people. It uses a communications technology known as Cellular Digital Packet Data (CDPD) to give police, fire, and rescue personnel access via laptop computers to public safety databases for information ranging from vehicle registrations and drivers licenses to outstanding warrants and investigative reports. In effect, the officer on patrol has at his fingertips all the data that can be found in the computer back at headquarters.

"Recoveries of stolen vehicles have jumped 300 per cent since the system was installed."

Terry Ingram
Executive Director, VECC

Reducing Crime

Though relatively new — VECC received its TIIAP funding in 1996 — the system already has produced impressive results: Recoveries of stolen vehicles have jumped 300 per cent since the

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system was installed, according to Terry Ingram, VECC's executive director.

The reason is fairly simple. Previously, an officer who needed to check a license plate or some other information would have to radio the communications center, and then get switched to a "service channel," where a staffer could look up the information. At a busy time, such calls from the field could stack up at headquarters; officers would sometimes find themselves waiting in line to be helped. In many cases, officers were reluctant or unable to wait. Now, however, officers can retrieve the information themselves in just seconds. The process is so much easier that many officers routinely check more license plates than they ever did in the past — and this has translated directly into more recovered vehicles.

Ingram says the system also is producing significant cost savings. In the last seven years, the number of calls between the dispatch center and police has climbed 90 per cent. Normally, Ingram says, he would have to be installing more radio channels and hiring more dispatchers and central office staff to handle information requests from the field. But, despite the increase, the center has managed without increasing either.

Ingram also believes the system is cutting the time police have to spend doing paperwork. In some routine cases, reports can be filed automatically, using computer functions keys. But even if a more detailed report is required, officers often can type the information they need directly into the computer, rather than having to take notes in the field, give them to a clerk to type at headquarters, and then review them for accuracy.

Greater Public Safety at Affordable Costs

Ingram sees even bigger gains in the future. He says VECC plans to start using the system to dispatch officers

and emergency vehicles. "Voiceless dispatch" should reduce administrative costs by automating many of the routine messages that flow back and forth between headquarters and the field. More important, it will increase the amount of information available to personnel in emergency situations. Because radio transmissions can easily be intercepted, police, fire and rescue departments currently limit how much

information they broadcast. The CDPD system, however, allows much more extensive information-sharing because it has several levels of encryption that ensure security.

Ingram says VECC has managed to avoid the kind of technical problems that complex communications projects can entail by using the existing cellular telephone network, rather than creating its own system. Besides the cost of central servers, laptops (about $1,200 each) and CDPD modem-transmitters (priced at under $600 each), the department pays a cellular provider $50 a month per laptop connected to the system. "We lease the service, and they maintain and upgrade it," he says. Moreover, as competition increases in the communications business, cellular costs are coming

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down; in some places, Ingram says, connections can be made for as little as $35 a month. If that still seems expensive, Ingram notes, the alternative — new radio towers, more channels and more central office staff — is costly too.

Police forces that participate in VECC are persuaded of its value. One participating department is developing scanners that will enable officers to check fingerprints from their laptops. Another wants to develop electronic mug shots.

Ingram believes cellular data communications will catch on among more police and emergency departments as the advantages are recognized. And that, in turn, could bring new benefits. Among other things, it should facilitate communication among departments scattered over a wider area. Currently, with some agencies using VHF and others using UHF frequencies, communications among different emergency agencies can be spotty. But a cellular system could allow seamless communications over wide areas — a capability that could come in handy in natural disasters and other emergency situations.

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Minot State University

Minot, North Dakota

Minot State University: Learning at a Distance

Universities play vital roles in the lives of communities. In places like North Dakota, where the population is spread over vast stretches of prairie, however, it takes extraordinary effort for academicians to reach the public they hope to serve.

Minot State University is seeking to meet that challenge by building a wide area network linking it with seven small communities scattered across northwest North Dakota. Launched in 1995, the North Dakota Wide Area Network (NDWAN) has quickly proven itself to be a valuable addition to prairie life — so valuable, in fact, that university officials now plan to make their entire core curriculum available to students online within the next five years. At the same time, the project has spun off a variety of community-building activities in the small towns linked to NDWAN. One such town, Stanley, North Dakota, has even acquired its own server through their local telecommunications carrier to continue — and expand — online activities now that the project's TIIAP grant has run out.

> ***"We're so remote it's hard to communicate. This is a great opportunity for teachers and students, and also people in community. We're proud of what we've done."***
>
> ***Allen Burgad***
> *High School Principal*

Aggregating Demand Brings Advanced Placement Courses to North Dakota

Distance learning benefits both students and the university, argues Joseph Ferrara, Project Director and Professor of Special Education at the university-run North Dakota Center for Persons with Disabilities. In the small towns of North Dakota, he says, many high

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schools do not have enough students to justify hiring teachers for all the different courses one finds in larger schools. Lacking advanced placement courses, for instance, a number of seniors each year exhaust the curriculum before they graduate.

By reaching many small schools at the same time over its network, Minot State University can assemble enough students to warrant courses the high schools cannot afford individually. Students who have completed their high school course requirements can now start collecting college credits, and the university has a leg up on its competition in attracting students who may subsequently enroll full-time. "We see this as a powerful recruiting tool," says Ferrara. "If we do a good job (online), kids will want to come here full-time."

Success does not come automatically, though. According to Ferrara, numerous obstacles must be cleared. Deans must be convinced of the value and quality of distance learning courses. Professors need help preparing course materials for online presentation. University and government officials must be persuaded that remote students should be counted in formulas that base funding on the number of students the university is teaching. And online students themselves must be able to receive the full array of university services — ranging from financial aid information to counselling — available to resident students.

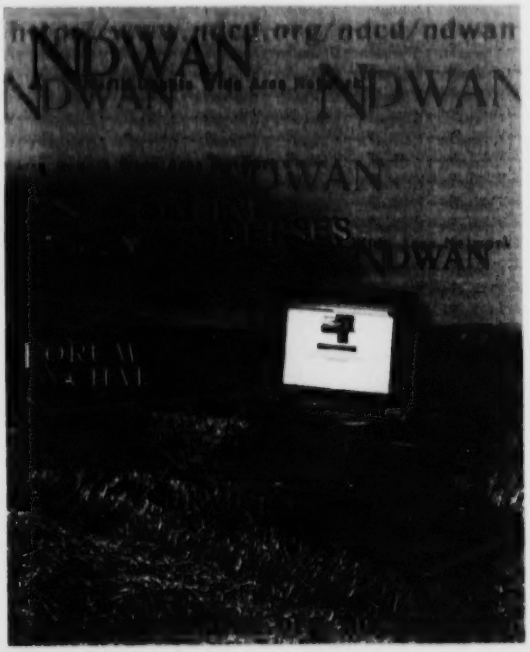
"If a kid has questions about scholarship money, you have to have a button he can click and get an online response the next day," says Ferrara. "You're going to be viewed as competent or incompetent depending on how well you respond."

Minot State University has made a substantial commitment to offering high-quality services online. It has established a full-time position of director of MSU Online to facilitate course development and presentation. It developed its own software for offering courses and administering online tests. And it has a graphic

designer to help prepare course materials, some of which professors end up using for on-campus as well as electronic classes.

Providing On-line Education for Lifelong Learners

Meanwhile, the North Dakota Wide Area Network also helps the university serve adults throughout its region. One professor conducts a lively forum on early childhood issues, such as attention deficit disorder, offering online participants a steady stream of resources and advice. Another hosts a forum on vision problems, drawing on internationally-recognized authorities. Yet another sponsors a listserv — an Internet mailing list — for Vietnam veterans. And the university is working with an Illinois consulting company to offer health, or "wellness," instruction to North Dakotans. This program is generally available only to large corporations, which offer it as an employee benefit in hopes of reducing health insurance costs. Because there are no large employers in northwest North Dakota, the program previously was not available to residents of the region. But NDWAN believes it can assemble an audience large enough to bring the program to the rural area.



In addition to enabling the university to spread knowledge through its region, NDWAN also helps scholars collect valuable information. Ferrara notes, for instance, that he and his colleagues have benefitted from contacts with disability workers

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and other human-services professionals, who use NDWAN for e-mail and Internet services. "It's very useful to have contact with these people, to find out what they need in the way of research," Ferrara says. "The more contact we as a university have with people who are out in the field, the more opportunity we have to direct our research in ways that are truly useful."

In Stanley, high school principal Allen Burgad is very enthusiastic about the project. The school has about 260 students in grades 7-12. In the 1996-1997 school year, four students took English 101 at Minot, and eight more plan to do so in 1997-1998.

Being able to take college courses is just one of the advantages Burgad sees to being online. His school has put in extra lines to accommodate a full-time consultant who advises about 50 farmers on accounting and computer issues. Farmers pay the coordinator's costs and get Internet access as a bonus. Students at the school, meanwhile, have designed web pages for various community organizations and businesses — including Prairie Knife Outfitters, which offers trail rides in the North Dakota badlands, and Flickertail Village, a tourist attract that features a model of small town life around the year 1800.

The school also is designing a sociology course on issues faced by senior citizens. Students who take the course, which is planned for the 1997-1998 school year, will subsequently help seniors in the community learn how to use the Internet themselves.

"We're so remote it's hard to communicate," says Burgad. "This is a great opportunity for teachers and students, and also people in community. We're proud of what we've done."

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Southern Ute Tribal Council

Ignacio, Colorado

Ignacio: One of America's Most Remote Places Comes Online

Ignacio, Colorado, is about as far from America's communications hubs as you can get in the continental United States. But it, too, is joining the information revolution.

Located about 25 miles from Durango, Colorado, in the remote southwest corner of the state, Ignacio is a seven-hour drive and two mountain ranges away from Denver. In 1995, the Southern Ute Indian Tribe, whose headquarters is a mile north of the town limit, joined forces with the Ignacio Public Schools, Fort Lewis College, and TIIAP to create an information infrastructure that would link the tribe, the schools, and residents of the town to the Internet.

It was not easy, but Ignacio is well on its way. Ignacio's public schools, the tribal administration building, and the Southern Ute Education Center now all have their own networks and Internet connections. More than 130 people have received Internet training. In an area that had almost no Internet connections before the project began, there now are about 100 regular Internet users (not counting students) and a similar number of less frequent users. Dial-up and e-mail messages climbed from 1,453 in June 1996 when it became available to over 9,000 in October. And the community now has its own web page, providing information on everything from Ignacio town government to Southern Ute culture.

> ***"We're entering into the computer age. Technology has been a lot of help to us and the people we work with."***
>
> *Leonard Burch*
> *Member, Southern Ute Tribal Council*

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Networking Brings Economic Opportunity to Tribe

Members of the SouthernUte Tribal Council, who had been skeptical about the project, have now given networking their seal of approval by allocating $294,000 to establish their own information network to manage the tribe's gas-production and casino businesses. Tribal council members, many of whom only had typerwriters in their offices a few years ago, now use laptop computers. And to encourage the spread of computer technology among members of the tribe, the council pays half the cost, up to $1,200, for tribe members who buy computers for their personal use. In the last two years, the tribe has spent the entire $35,000 provided for such purchases, and there is a waiting list of tribal members who want to take advantage of the program.

"We're entering into the computer age," says Leonard Burch, a member of the tribal council. Technology, he adds, "has been a lot of help to us and the people we work with."

Among the most enthusiastic technology users in Ignacio is Rick Jefferson, Assistant Director of Education for the Southern Ute Indians. He works at the tribe's education center, which provides educational enrichment programs for Southern Ute children, helps older kids with their homework, and offers tutoring for students who are having trouble in school. The center also sponsors adult education, early childhood, and school-to-career programs.

To do its job well, Jefferson says, the tribal center has to keep close track what Southern Ute children are doing in school. Currently, such information is exchanged by hand along what Jefferson and other tribal members call the "moccasin network" — that is, by people walking between different buildings carrying paper. Linking the school's and the education center's networks will make the job a lot easier and more efficient, Jefferson argues.

Tribe, Schools, and Businesses Invest in the Information Age

"We need to get into the twenty-first century or we'll be left behind again," Jefferson says of the tribe and its computer networking efforts.

Like many computer networking projects, the Southern Ute information infrastructure has helped pull together disparate elements of the Ignacio community. The school system, where 48 per cent of the students are Anglo and 22 per cent are Hispanic, has developed a closer working relationship with the

tribe. Some teachers take their classes to the tribal center to use the computer labs, for instance. Sarah Noon, a kindergarten teacher, searches the Internet for lesson plans. Last year, she taught her students about rainforests by showing them information she downloaded — including Internet sites that carried pictures and sounds from actual rainforests.

Project sponsors say that one of the key lessons learned from the Southern Ute project is the importance of enlisting support for networking from the highest levels of tribal government. At the outset, the project lagged because Tribal Council members were concerned that Internet connections would enable hackers to obtain confidential tribal information. Once those concerns were eased, the leaders agreed to support the project.

Despite the solid start, the Ignacio project has a long way to go. Noon says that only a few teachers have embraced the Internet, as yet. And while the Ignacio web page provides a lot of information about the community and its region, participants say it is difficult to enlist volunteers to update the material. Still, students now regularly drop into the tribal education center to use the Internet. E-mail continues to grow in popularity. And enthusiasts like Jefferson already are looking to new and more exciting applications of communications technology.

The tribal educator enthusiastically describes recent discussions about the creation of a fiber optic connection from Denver that would run through the Southern Ute reservation down to Albuquerque, New Mexico, and Phoenix, Arizona. If that happens, Jefferson notes, "we could have teleconferencing, two-way video, telemedicine...all kinds of things that aren't possible now."

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Center for Rural Development

Somerset, Kentucky

Economic Development in Rural Kentucky

Mountains give southeastern Kentucky its distinctive beauty, but they can isolate the people who live there from the educational opportunities and other services essential to economic and social development. With new distance-learning tools, however, the people of the economically-ailing region are starting to overcome their isolation.

"Technology offers us the ability to rise above the mountains and to communicate and share ideas," says Hilda Legg, Executive Director of the Center for Rural Development, a comprehensive economic-development center, communications hub, and cultural nexus for 40 rural counties in the region.

Based in Somerset, Kentucky, the center houses a wide array of economic-development institutions, convention facilities that can host groups as large as 2,500 people, and even a theater company. Its communications backbone allows two-way interactive video and document conferencing among four community colleges, as well as links to the outside world.

> ***"Technology offers us the ability to rise above the mountains and to communicate and share ideas."***
>
> ***Hilda Gay Legg***
> ***Executive Director***
> ***Center for Rural Development***

Higher Education in the Hollows

Using the TIIAP-supported network, the four colleges have been able to assemble enough students to support classes they could not offer individually. And they have been able to draw enough

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students to justify using full-time faculty for such course offerings instead of having to hire part-time faculty to travel between campuses. In addition, the economies of scale have enabled the University of Kentucky to bring advanced courses to mid-career people living near the four community colleges — including classes on education for children with severe disabilities, labor organization and management, medical parasitology, and uses of instructional technology in special education.

Other organizations have also used the network to provide educational services in the region. The Army National Guard has offered classes to members of the reserve on global positioning systems and how to use gas masks; without the center's network, the reservists would have been forced to travel to Fort Knox for the lessons. In addition, the Kentucky Highlands Investment Corp., a nonprofit development organization based in London, Kentucky, offers seminars for small businesses on accounting and financial planning. The Kentucky state attorney general, meanwhile, sponsored a seminar on child and sexual abuse, and the state of Kentucky offered local employers briefings on new insurance regulations.

One-Stop Economic Development

A number of organizations that have opened offices in the center can also use its communications capabilities to reach people who otherwise might not be able to come to Somerset in person. The Small Business Administration runs a "One Stop Capital Shop" that seeks to help business people with their financing needs. The state of Kentucky runs a program to help businesses qualify for government procurement contracts, and another program to provide technical consulting on information systems. The University

of Kentucky runs a cooperative extension office which, among other things, has offered computer training for people at the center and the community college sites.

The International Trade Administration, which operates an export-assistance office at the center, helped demonstrate one of the center's most dazzling technological capabilities. When a department official traveled to Argentina on an export-promotion mission, the center established a live link with him, showing how businesses can use teleconferencing technology to develop potential export markets.

Meanwhile, the center seeks to generate tourism through its own convention business, which Legg says has become a money-making venture. The center's theater, known as the Lake Cumberland Performing Arts, has not made money for the center, but it, too, serves a vital function, she argues. The theater helps attract businesses to the region, according to Legg. "If a small business approaches us and is thinking about locating here, it wants to know what our technological capabilities are, what are school system and hospital are like, and what kind of cultural life we have," she explains.

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As all of this demonstrates, the center construes its mission broadly. "We take a holistic approach to economic development," says Legg.

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Mississippi Department of Education

Jackson, Mississippi

Tech Crews: Learning by Doing in Mississippi

On the first NetDay of 1997, a group of volunteers gathered to bring St. Joseph High School in Jackson, Mississippi, into the digital age. The school lacked the internal wiring needed to operate a computer network, and there were few experts in the region who could do the job at a price it could afford.

High School Students Learning Technology and Teamwork

But St. Joseph got a big boost from an unlikely source: the volunteers were led by a group of high school students from five Mississippi school districts who received training in network operations, web design, and computer software under a TIIAP project directed by the Mississippi Department of Education. On NetDay, the "tech crews" put their newfound knowledge to the test.

> ***"The day ended with many smiles and with the knowledge that not only had they helped another school realize their Internet/Intranet dream but that they had gained further knowledge to carry back to their school districts."***
>
> ***Ellen Davis Burnham***
> ***Technology Specialist***
> ***Mississippi Department of Education***

"Tech crew members divided into teams, some measured the hallways, others looked in the ceiling to discover the secrets it held, still others checked out the electrical panel, phone box, patch panel location and checked to make sure that the requested drops were in appropriate places," recalls Ellen Davis Burnham, Technology Specialist for the department and coordinator of the tech crew project. After studying the school, the crews retired to a nearby

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lodge where they debated how best to wire the school and drew up a wiring plan. They returned to the school the next day at 7 a.m., splitting into teams to drill and install face plates, pull wire, and take all the other steps needed to install a computer network at the school.

"The day ended with many smiles and with the knowledge that not only had they helped another school realize their Internet/Intranet dream but also that they had gained further knowledge to carry back to their school districts," says a proud Burnham.

The Mississippi tech crews represent an imaginative solution to a problem that has prevented many schools from coming online as rapidly as they would like. Even where the will to use the Internet in classrooms exists, many school districts lack the technical expertise to build and maintain computer networks. That can be a particularly serious barrier in rural areas, where technical expertise is lacking in the surrounding community as well as in schools. One Mississippi school district had to fly in a troubleshooter from Wisconsin to solve a networking problem.

Building Math and Science Skills for the Future

The Mississippi project, known as Connecting Communities, inaugurated the tech crews. In addition, Connecting Communities sought to create learning partnerships among parents, children, public schools, public libraries, and businesses in five rural communities using the internationally recognized Family Math and Family Science programs. In those programs, parents and their children work on real-life math or science investigations. Computer local area networks were to provide communications links for participants.

As interesting as the curriculum ideas may be, it's the student tech crews that have given the effort much of its energy and momentum. "The tech crews brought communities together," says Burnham. "They got parents, teachers, grandparents, librarians, school boards — everybody — working together."

After receiving training, each tech crew developed a local area network in its own school. Each tech crew also has worked to wire at least one other school in its area. In addition to providing technical support, tech crews have been forceful

advocates for wiring the schools; in Greenville, a skeptical school board embraced the networking idea after students showed up one night to teach board members how to use e-mail.

Tommy Wolfe, Technology Coordinator for Winona public schools, says members of the tech crews have gained valuable educational experience even as they help their schools. He says network trouble-shooting has helped the students hone their thinking skills, and he predicts the knowledge they have obtained will serve them well as they enter the labor market. "I don't care what a person does in the future, they're going to have to have some background in computers and computer networks," he says.

Matthew Biggers, 17, a member of the Winona tech crew, agrees the project has taught students some valuable lessons. "It helps us learn team work. It helps you learn to work with people," he says. "We give presentations at conferences, so it has really helped me with speaking in public."

Eventually, Wolfe and others believe the tech crews could become the core of a technical and social infrastructure that rural Mississippi sorely needs if it is to join the Information Age. Like many tech crew members, Biggers says he hopes to pursue a career in technology. In the short run, he says, that may require him to leave his rural community. But he has high hopes that he soon will be able to return.

"The way things are going now, I'll be able to move back," he says. "There has been a lot of technological progress in our state. Connecting Communities really has helped communities get access, and now communities even more rural than we are have become interested."

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Metropolitan Area Advisory Committee
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Bringing the Information Revolution to Inner Cities

It will take a lot more than a substantial investment in infrastructure to make sure the information revolution reaches inner cities. A sustained commitment to training people how to use technology also will be required.

That is one of the lessons that have emerged from two ambitious TIIAP projects designed to connect disadvantaged urban neighborhoods to the Internet. Though their projects are quite different from each other, their sponsors have come to similar conclusions on such issues as the continuing need for training.

Inner-City Net, a 1995 TIIAP project, was launched by the Metropolitan Area Advisory Committee in San Diego, to install computers, provide Internet access, and offer training for both professional staff and clients at five social service agencies serving low-income neighborhoods with large populations of Latinos and other minority groups. The other TIIAP project, the Neighborhoods and Non-Profits Network, was established by the University of Illinois at Chicago, the Information Technology Resource Center, and the Donors Forum of Chicago to provide modems, basic communications software, Internet access, and training for some 50 organizations in the low-income and moderate income Pilsen and Near West Side neighborhoods of Chicago.

> ***"There is a growing network of cooperation among dozens of organizations and the university community that is addressing some of our enduring problems."***
>
> *Albert Schorsch*
> *Assistant Dean*
> *College of Urban Planning and Public Affairs, University of Illinois*

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Inner City Access to Jobs, Family and Medical Care

Both projects found considerable interest in the new technology among people who work and live in disadvantaged neighborhoods. In San Diego, many members of the public use the Internet for information about jobs, while staff of social service agencies find it most useful to learn about grant programs and other funding possibilities, says Susan Myrland, Inner-City Net's project manager.

In Chicago, where the University of Illinois project involved a more diverse group of organizations, uses have been more varied. One community museum is working to put its entire collection online. Other groups, including family-care and medical centers, use it for access to the latest research on professional issues. A center for the disabled uses it mainly as a source of entertainment — in effect, therapy — for clients. Others use it to collect information about the community; among other things, they have been able to consult professors at the university and tap into an extensive database maintained at the university's Center for Urban Economic Development.

"The whole phenomenon has been varied and very personal," says Albert Schorsch, Assistant Dean of the College of Urban Planning and Public Affairs at the university.

Myrland and Schorsch agree that training is crucial to the success of a community networking project. "I was surprised how much training was needed," says Myrland. Many existing training materials assume a level of familiarity with computers that many people in low-income communities lack, she adds. "They'd tell you how to do html, when we had people who didn't know what a mouse is," she says. As a result, MAAC found itself developing a lot of training materials on its own.

Inner-City Net faced a particular challenge in dealing with a large non-English speaking population. Often, it was not clear how best to translate computer terms such as "mouse," "bookmark," or "windows," notes Myrland. To prevent mistakes or poor translations, MAAC ran all its translations for online tutorials past instructors at a nearby community college as well as several other people before settling on the exact wording of its Spanish training materials.

Myrland hopes that MAAC will be able to share much of its training material with other groups. But she and Schorsch agree that training must continue indefinitely even in projects that have been running for years. "You have to prepare for decay in personnel and machines," says Schorsch. Rapid turnover at participating agencies requires that new staff be trained continuously. Frequent changes in technology require new training in software and hardware. And as organizations become more technologically sophisticated, their own demands for machines and training mount as well.

All this demonstrates that organizations must be willing to sustain their commitment to a technology program over

a long period of time. That, in turn, requires that support for computer networking efforts reach the top of community organizations. "The boss has to be willing to learn about the Internet and to commit some staff to be responsible to do the training and maintain the system," argues Schorsch. "If you don't have continuing organizational and mechanical infrastructure, it's not going to work."

Training Strategies that Work for Underserved Populations

Projects like Inner-City Net have learned a lot about what works, and what does not work, when it comes to specific training strategies. For instance, it was envisioned originally to hold large, one-shot, group sessions that would cover many topics, but it became apparent that this approach is ineffective. "You could see people start forgetting things as soon as they walked out the door," Myrland notes. Multiple, short sessions that give people opportunities to learn from practice work much better, she says.

The exact placement of computer terminals within agencies also has proven to be vitally important. MAAC learned that staff at the agencies generally did not use the system unless they had computers at their desks. Easy access also is important for clients. One San Diego agency, the Urban League, reported heavy use at a public access terminal that it placed right inside its front door.

Agencies where coordinators or trainers are readily available to clients fare much better than those where clients cannot get help as easily. And picking the right people to serve as trainers has proven to be essential. Often, according to Myrland, agencies name a high-ranking staffer who

subequently is too busy to help clients. A far better approach is to assign somebody who can be readily available, such as a receptionist who may sit near a public access terminal, she says.

Similarly, some agencies mistakenly designate whatever staff person is most proficient with technology. "Technology geeks may not be the best people to work with new users because they assume everybody knows what they know," Myrland reports. Much more important than technical skills, she says, is enthusiasm. "If someone likes working with other people, we can train them in the technical stuff," she notes. "But if they don't like working with people, or don't think it's their job, all the technical training in the world won't help."

Incentives for Cooperation in the Community

For all the work that is required, Schorsch and Myrland are both convinced that the effort is worthwhile. Schorsch, for instance, cites growing cooperation among the various agencies that have worked together on the networking project. He reports, for instance, that negotiations are underway with a number of UIC-NNNet organizations to formalize existing partnerships with high schools to develop "community information development centers" at the schools. The centers will put out essential neighborhood information, such as demographic statistics and reports on community meetings, over the Internet. In addition to helping the neighborhoods, the project will teach students skills they can use to find jobs in new scanning, editing, and web design businesses the sponsors also hope to create.

"If we hadn't done all the work we did — all the networking, getting to know people and coming to know how hard it is to introduce technology — we couldn't be doing what we're

doing now," says Schorsch. "There is a growing network of cooperation among dozens of organizations and the university community that is addressing some of our enduring problems."

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Conclusion

As the projects profiled in this report demonstrate, each effort to extend information technology has been an adventure and a learning experience. Often, participants end up in places they never expected to go.

When Archie Prioleau and his Foundation for Educational Innovation in Washington, D.C., set out to take students on virtual visits to distant museums, for instance, nobody could have predicted that he eventually would end up with a new theory of schooling, a new design for school computer laboratories, and a new community-wide project to train students in the skills needed to be computer network operators.

And who would have guessed when the Newark Public Schools set out to build a computer network linking medical professionals with residents of a low-income housing development that residents would use the computers not only to obtain health information but to form a wide range of support groups and persuade a landlord to build a new recreation center? Or that when the Children's Alliance of New Hampshire sought to computerize and standardize screening procedures for social service agencies that the organizations would seize the opportunity not just to streamline their administrative procedures but to marshall resources in ways that will strengthen the social safety net?

These and numerous other telecommunications projects show that the information revolution is not so much a process by which technology is changing society as one in which people are using technology to pursue their own goals for economic growth, educational opportunity, public safety, improved health, responsive government and strong communities.

These projects also show that the desire to use the emerging tools of the information age is at least as great — perhaps greater — in isolated rural areas and troubled inner cities as in the suburbs, as great among racial and ethnic minorities everywhere as among the more affluent and connected majority. Indeed, some of the biggest success stories from these early stages of the information revolution involve cases where isolated or low-income individuals and communities — whether teenagers running a web-design business in California or residents of impoverished neighborhoods in St. Louis using computers to trade with each other for services they cannot afford to buy — have used technology to help themselves.

Perhaps most important, though, these projects demonstrate that the effort to create a seamless information infrastructure is a job for everyone. The relative roles of players change from situation to situation. In Minot, North Dakota, and Chicago, universities took the lead, while in Munhall, Pennsylvania, the police department led the initiative. In New Orleans, a nonprofit "free-net" spearheaded the effort, while in Phoenix, Arizona, city government did. In many cases, new information networks became possible only when diverse community institutions looked beyond their own immediate interests and forged cooperative relationships with each other. And the participants say the new spirit of collaboration that the technology projects have helped foster ultimately may prove to be as valuable as the actual infrastructure that is getting built.

In some cases, benefits are tangible and quantifiable. The increase in stolen-vehicle recoveries in Utah clearly attests to the value of putting police online, and the cost effectiveness of electronic nursing services over in-person home health visits is unquestionable. In other cases, the results may be harder to quantify, though they are no less real: witness the new sense of pride and self-worth shown by East Palo Alto youths able to support themselves and provide a public service designing web pages for community nonprofit groups, or the quiet competence with which high school students in Mississippi are helping not only their own schools but neighboring ones as well to install their own networks.

Perhaps the best evidence of the value of these projects is the fact that in most cases their sponsors have decided to continue them after their federal grants have expired. The decision of the Southern Ute Tribal Council to maintain its computer network, and the Louisiana State Legislature's agreement to finance expansion of the Greater New Orleans Free-Net leave little doubt that people are convinced of the value of an up-to-date telecommunications system.

The future of the information infrastructure is as hard to anticipate as the rapidly changing underlying technologies themselves. However, we now have a growing number of models that can help those involved in future efforts to make informed choices. With flexibility to adjust to changing conditions and learn from experience, and with a willingness to work together, our possibilities are limited only by what we ourselves can imagine.

Notes

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